IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

First Named Inventor : Max Donath	Appeal No. ---
Appln. No.: 10/091,182	
Filed : March 5, 2002	Group Art Unit: 3661
For : REAL TIME HIGH ACCURACY GEOSPATIAL DATABASE FOR ONBOARD INTELLIGENT VEHICLE APPLICATIONS	Examiner: Eric M. Gibson
Docket No.: U11.12-0145	

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION - 37 C.F.R. §41.37)

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I HEREBY CERTIFY THAT THIS PAPER IS BEING SENT BY U.S. MAIL, FIRST CLASS, TO THE COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450, THIS
1ST DAY OF DECEMBER, 2004.

PATENT ATTORNEY

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on October 8, 2004.

FEE STATUS

[x] Small entity status under 37 C.F.R. §§ 1.9 and 1.27.

FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. §41.20(b)(2) the fee for filing the Appeal Brief is $170.00.

The Director is authorized to charge any additional fees associated with this paper or credit any overpayment to Deposit Account No. 23-1123. A duplicate copy of this communication is enclosed.

Respectfully submitted,

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BRIEF FOR APPELLANT

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PATENT ATTORNEY

This is an appeal from an Office Action mailed May 21, 2004 (hereinafter "Office Action"), in which claims 1-43 were finally rejected.

REAL PARTY IN INTEREST

The University of Minnesota, a corporation organized under the laws of the state of Minnesota, and having offices at 450 University Gateway, 200 Oak Street, Minneapolis, MN 55455 has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment, which was filed with the United States Patent and Trademark Office on June 11, 2002 and recorded on Reel 012989, Frame 0716. A copy of the Assignment is provided in the Appendix to this document.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences which

will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF THE CLAIMS

I. Total number of claims in the application.

Claims in the application are: 44

II. Status of all the claims.

A.	Claims cancelled:	none
B.	Claims withdrawn but not cancelled:	none
C.	Claims pending:	1-44
D.	Claims allowed:	none
E.	Claims rejected:	1-43
F.	Claims Objected to:	44

III. Claims on appeal

The claims on appeal are: 1-44

STATUS OF AMENDMENTS

An Amendment After Final was mailed July 16, 2004. In the Amendment, claim 44 was rewritten in independent form to place the objected claim in condition for allowance. In the Advisory Action mailed July 30, 2004, the Examiner indicated that, for purposes of Appeal, the proposed Amendment would be entered. In the Office Action mailed May 21, 2004, the Examiner indicated that claim 44 would be placed in condition for allowance if rewritten in independent form, as presently amended.

SUMMARY OF THE INVENTION

The present invention is directed to a geospatial database management system (GDMS) 10 [FIG. 1]. As described in independent claim 1, the GDMS is mounted on a host vehicle 12, managing geospatial data relating to travel paths having one or more lanes [FIG. 1; page 6, line 22 - page 7, line 3]. The GDMS includes a geospatial database 20, a database manager 22, and a query

processor 24 [FIG. 1]. The geospatial database stores data elements (i.e., objects) that are indicative of real world objects (e.g., road lane boundaries - FIG. 3, road shoulders, and other road features) and a location of the real objects in three dimensional space (i.e., longitude, latitude, and elevation coordinates) [page 7, line 27 - page 8, line 2; page 10, line 15 - page 11, line 8; page 13, line 8 - page 14, line 18]. The objects have a lane-level resolution and the location has an accuracy of approximately one decimeter or less [page 26, lines 3-28]. The database manager component is configured to maintain the data elements in the geospatial database and receive database queries from a driver assist subsystem 14 configured to assist a driver of the host vehicle based on the data elements stored in the geospatial database [FIG. 1; page 6, line 22 - page 8, line 2]. The query processor is coupled to the database manager component and the geospatial database and is configured to receive the database queries from the database manager component, query the geospatial database based on the database queries and return query results to the database manager component [FIG. 4; page 18, line 27 - page 20, line 4].

Independent claim 23 describes a GDMS 10, which is designed for use on a host vehicle 12 with a driver assist subsystem 14 [FIG. 1; page 6, line 22 - page 7, line 3]. Additionally, the GDMS includes a geospatial database 20 that stores objects having attributes indicative of items relating to a travel path for the host vehicle and a location of the items in a coordinate system [page 10, line 15 - page 11, line 9; page 11, line 22 - page 13, line 7; page 13, line 27 - page 14, line 18; FIGS. 2, 3 and 6]. Additionally, the objects are stored with a lane-level resolution sufficient to distinguish among different lanes in the travel path [page 13, lines 21-26; page 16, line 18 - page 17, line 13; page 26, lines 3-28]. The GDMS also includes a database accessing system (database manager 22 and query processor 24) configured to

access the objects in the geospatial database, in response to a query from the driver assist subsystem, in substantially real time [FIG. 1; page 6, line 22 - page 8, line 2; page 26, lines 3-17].

Independent claim 27 is directed to a GDMS 10 that is designed for use on a host vehicle 12 with a driver assist subsystem 14 [FIG. 1; page 6, line 22 - page 7, line 3]. The GDMS includes a geospatial database 20 storing objects having attributes indicative of items (i.e., road lanes, road shoulder, guard rails, curbs, sign posts, etc.) relating to a travel path for the host vehicle and a location of the items in a coordinate system, the location being accurate to within approximately one decimeter [FIGS. 2, 3 and 6; page 10, line 15 - page 11, line 9; page 11, line 22 - page 13, line 7; page 13, line 27 - page 14, line 18; page 18, lines 1-10; page 26, lines 18-28].

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. The rejection of claims 1, 6-14 and 27-30 under 35 U.S.C. §103(a) as being unpatentable over Smith et al. (U.S. Patent No. 6,184,823) in view of Rogers et al. (U.S. Patent No. 6,144,335).

II. The rejection of claims 2-5 under 35 U.S.C. §103(a) as being unpatentable over Smith et al. (U.S. Patent No. 6,184,823) in view of Rogers et al. (U.S. Patent No. 6,144,335).

III. The rejection of claims 15-22 under 35 U.S.C. §103(a) as being unpatentable over Smith et al. (U.S. Patent No. 6,184,823) in view of Rogers et al. (U.S. Patent No. 6,144,335).

IV. The rejection of claim 23 under 35 U.S.C. §103(a) as being unpatentable over Smith et al. (U.S. Patent No. 6,184,823) in view of Rogers et al. (U.S. Patent No.

6,144,335).

V. The rejection of claims 24-27 under 35 U.S.C. §103(a) as being unpatentable over Smith et al. (U.S. Patent No. 6,184,823) in view of Rogers et al. (U.S. Patent No. 6,144,335).

VI. The rejection of claims 31 and 32 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823) and Rogers et al. U.S. Patent No. 6,144,335) in view of Schofield at al. (U.S. Patent No. 5,949,331).

VII. The rejection of claim 33 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823) and Rogers et al. U.S. Patent No. 6,144,335) in view of Schofield at al. (U.S. Patent No. 5,949,331).

VIII. The rejection of claim 40 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823) and Rogers et al. U.S. Patent No. 6,144,335) in view of Schofield at al. (U.S. Patent No. 5,949,331).

IX. The rejection of claims 34, 36, 37, 41 and 42 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823) and Rogers et al. (U.S. Patent No. 6,144,335) and in view of Wilson-Jones et al. (U.S. Patent No. 5,765,116).

X. The rejection of claim 35 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823), Rogers et al. (U.S. Patent No. 6,144,335), Wilson-Jones et al. (U.S. Patent No. 5,765,116), and Breed et al. (U.S. Patent No.

6,370,475).

XI. The rejection of claims 38 and 39 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823), Rogers et al. (U.S. Patent No. 6,144,335) and Breed et al. (U.S. Patent No. 6,370,475).

XII. The rejection of claim 43 under 35 U.S.C. §103(a) as being unpatentable over the combination of Smith et al. (U.S. Patent No. 6,184,823), Rogers et al. (U.S. Patent No. 6,144,335) and Dobler et al. (U.S. Patent No. 6,038,496).

ARGUMENT

I. REJECTIONS OF CLAIMS 1-30 UNDER 35 U.S.C. §103 AS BEING UNPATENTABLE OVER SMITH ET AL. (U.S. PATENT NO. 6,184,823) IN VIEW OF ROGERS ET AL. (U.S. PATENT NO. 6,144,335) ARE IMPROPER

A. OVERVIEW OF THE PRIOR ART

Smith et al. utilize a geographic database that includes location and name information for roads and intersection points and other points of interest of a geographic region. The geographic database can be used by a navigation application program to identify various points of interests including roads and intersection points in the geographic region by name, to provide location information, and route guidance. The various points of interest that are stored in the geographical database are defined by single location points or nodes, which are not in close proximity to other points of interest. For example, road sections are defined by beginning and end points that extend along the length of the road, and road intersections are defined by single points, as illustrated in FIGS. 4 and 10A-10D. The

nodes are not located in close proximity to each other and are not spaced across a width of the road.

Rogers et al. relates to post-processing of Global Positioning Satellite (GPS) field data to achieve corrected position information for the data collected by the GPS receiver in the field [column 1, lines 6-8]. The post-processing of the GPS field data is necessary to provide more accurate position information for surveying and mapping purposes, something which the 10-100 meter position accuracy of GPS receivers are incapable of providing [column 1, lines 19-34]. In order to improve the inaccurate position information of the roving GPS receiver, a base GPS receiver is placed in a precisely known position, such as the National Geodetic Survey (NGS) [column 1, lines 34-38]. The roving GPS receiver is used to collect data from various points, from which the roving GPS receiver's position relative to the base receiver can be calculated [column 1, lines 38-45]. The position information can be corrected to produce highly accurate position information using a differential correction scheme performed by an office-based computer [column 1, lines 51-66].

B. OVERVIEW OF THE PRESENT INVENTION AND A GENERAL COMPARISON TO THE PRIOR ART

The mandate of 35 U.S.C. §103 is that the invention as a whole must be considered in an obviousness determination. The invention as a whole embraces the device, its properties and the problem it solves. Thus, the determination of whether a novel device is or is not obvious requires cognizance of the properties of that device and the problem which it solves, viewed in light of the teachings of the prior art. Also, a diversion of purpose between the claimed element and a corresponding element of the prior art reference is the basis for finding that the combination is not suggested. Thus, an important consideration in deciding whether an invalidating suggestion is present, is a comparison of

the purpose, functions, and problems addressed by the present invention and that of the cited references.

The present invention has different properties and solves different problems than geographic databases of the prior art. The present invention is directed to a geospatial database management system that generally includes a geospatial database having data elements that are indicative of a location of various objects. The objects can be, for example, road lane boundaries, road islands, road lane centers, and other real world objects. One of the differences between the geospatial database of the present invention and geographic databases of the prior art is the resolution of the objects that are stored therein. The objects that are stored as data elements in the geospatial database of the present invention have a resolution that is significantly higher than the resolution of objects contained in digital maps and geographic databases used by navigational systems, such as that of Smith et al., as described on page 26, lines 18-28 of the present application. Preferably, the resolution at which the objects that are stored as data elements in the geospatial database of the present invention is at a lane-level resolution. That is, the separation between the locations of adjacent stored objects is less than or equal to a width of a lane of a road. Such a resolution allows for location and boundaries of the various objects, such a road, to be defined precisely.

Additionally, the locations of the objects indicated by the data elements stored in the geospatial database of the present invention are also preferably highly accurate. In accordance with a preferred embodiment of the invention, the accuracy is approximately 1 decimeter or less.

The resolution or proximity of adjacent objects, and the accuracy of the stored location of those objects as indicated by the data elements of the geospatial database of the present

invention, allow the geospatial database to be used by a subsystem 14 to provide unique assistance services to a driver of a vehicle 12 as compared to systems of the prior art. By way of example, subsystem 14 may provide an operator interface which conveys information to the operator indicative of the position of vehicle 12 within a lane of traffic, and also indicate to the driver information about objects around the vehicle [page 6, line 26 through page 7, line 3]. In one instance, subsystem 14 includes a head-up display that includes a display of LaneBoundaries that can be displayed in a manner such that they overlay the actual lane markings of a road on which the vehicle is traveling when viewed by the user [page 13, lines 13-19]. Accordingly, the geospatial database of the present invention solves the need of such a subsystem to have access to objects that are stored at a sufficiently high resolution and with a sufficiently high accuracy, something that prior art geographic databases fail to provide.

Geographic databases used by navigation systems of the prior art and digital maps lack the resolution of objects of the geospatial database of the present invention, as explained in the background of the present application. There are two main reasons that prior art geographic databases have such a low resolution. First, it is simply unnecessary because their purpose of providing a navigational tool does not require such a high resolution. Geographic databases and digital maps generally define the boundaries of roads, lakes, and other objects using multiple data points. For example, such data points may define location of an end point of the road, a location where the road changes direction, and a location of another end of the road. However, such data points are significantly spread out and do not have a resolution that captures details of the road, such as lanes of the road, which are insignificant for the purpose of general navigation. For instance, it is unnecessary to define an

intersection of roads with numerous location data points that define the boundaries of lanes of the roads at the intersection. Instead, a single point at the intersection is all that is required to provide the desired navigational function, as illustrated in Smith et al. in FIGS. 4 and 10A-10D. Therefore, such systems of the prior art lack any need for the storage of objects at a high resolution as provided by the present invention. More particularly, such systems of the prior art lack any need for the storage of objects that define various lane boundaries within a width of a road.

Second, prior art navigation systems have a desire to minimize the size of the database in order to preserve memory and improve performance. This is generally explained in Smith et al. at column 12, lines 7-22. Accordingly, such systems avoid the storage of data that would be excessive for their navigational purpose. Since the storage of objects at a lane-level resolution would fail to provide any significant advantage to a user for the purpose of navigation, the storage of objects at such a resolution would be excessive and, therefore, be undesired due to the need to preserve critical data storage space.

C. CLAIMS 1, 6-8, 9-14 AND 27-30 ARE NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL. AND ROGERS ET AL.

Appellant respectfully disagrees with the Examiner's assessment of the cited references and believes that the Examiner has failed to establish a *prima facie* case of obviousness against the claims. To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Additionally, the prior art reference (or references when combined) must teach or suggest all the claim

limitations. The teaching or suggestion to make the claimed combination must be found in the prior art, not in Appellant's disclosure.

In rejecting the claims, the Examiner found Smith et al. to teach several elements of independent claims 1 and 27 including the claimed geospatial database, database manager, and query processor of claim 1, and the claimed geospatial database and database accessing system of claim 27. The Examiner found Rogers et al. to teach the claimed accuracy of one decimeter or less. Finally, the Examiner concluded that it would have been obvious "to have an accuracy in location coordinates to approximately one decimeter or less in the invention of Smith, as achieved through well-known methods in the art shown by Rogers." However, the Examiner failed to provide any motivation for combining the references or making the necessary modifications to Smith et al.

The Federal Circuit has stated, "virtually all [inventions] are combinations of old elements." Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983). The Federal Circuit has also found that rejecting patents solely by finding prior art corollaries for the claimed elements would permit an Examiner to use a claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention, which would be "an illogical and inappropriate process by which to determine patentability." Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996). Accordingly, even seemingly simple changes require a finding of a suggestion in the prior art to make the modification to avoid the improper use of hindsight. In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

Appellant submits that no motivation to combine the cited references exists outside of Appellant's disclosure. In Section 10a of the Office Action, the Examiner argued that navigation

systems "depend on the accuracy of their locations in order to function properly and effectively", but failed to provide any support for the assertion. Appellant respectfully disagrees with the assertion that navigational systems, such as that described by Smith et al., require the claimed high accuracy in order to "function properly and effectively".

For instance, one utilizing the navigational system of Smith et al. has no need to know when he or she is within one decimeter of an intersection. Rather, accuracy on the order of twenty meters or more is sufficient to provide excellent navigational performance. Therefore, even if one assumes that the navigational system of Smith et al. could be modified to utilize the correction scheme of Rogers et al., there is still no reason to modify Smith et al. to have such an accuracy. Furthermore, nowhere in Smith et al. is there any suggestion of an accuracy problem or a need for more accurate location information.

Because the unsupported assertion presented by the Examiner is insufficient to form a basis of a suggestion or motivation to modify the navigational system of Smith et al. to have decimeter or less accuracy, Appellant submits that the Examiner is forced to rely on the teachings of Appellant's disclosure to discern the "obviousness" of the claimed invention. Such use of hindsight is improper. *In re Lee*, 61 USPQ2d 1430 (Fed. Cir. 2002)("It is improper, in determining whether a person of ordinary skill in the art would have been led to this combination of references, simply to '[use] that which the inventor taught against its teacher.'")(quoting *W.L. Gore v. Garlock, Inc.*, 220 USPQ 303, 312-13 (Fed. Cir. 1983)). Therefore, Appellant submits that the Examiner has failed to establish a *prima facie* case of obviousness against claims 1 and 27, since there is no suggestion or motivation for the combination of Smith et al. with Rogers et al.

Furthermore, even if a suggestion or motivation could be

found to combine Smith et al. and Rogers et al. outside of Appellant's disclosure, the combination would still not result in the formation of the present invention. In general, even if the accuracy of the location information contained in the geographic database of Smith et al. was improved using the correction scheme disclosed in Rogers et al., the geographic database of Smith et al. would still not form the geospatial database of the present invention as described in claims 1 and 28. In particular, Appellant submits that the Examiner has failed to identify where the cited references teach or suggest a geospatial database "storing data elements indicative of objects . . . the objects having a lane-level resolution", as described in independent claim 1, or a geospatial database that "stores the objects with lane-level resolution sufficient to distinguish among different lanes in the travel path", as described in claim 28. As described above, such a resolution allows the system of the present invention to assist users in different ways than can be provided by prior art navigational systems.

However, in reply to Appellant's arguments, the Examiner found that the road segment data of Smith et al. that included information on direction of travel, was at a lane-level [Section 10b of the Office Action]. However, nowhere in Smith et al. is there any disclosure that the direction of travel is based upon a lane-level resolution of the road segment data. Appellant submits that such a lane-level resolution is not used by navigational systems, such as that of Smith et al., since they form the road segments by points that are spaced much further than a width of a lane. Moreover, such points are used to define the entire road rather than lanes within a road. Appellant submits that for these reasons and those set forth below with regard to independent claim 23, the Examiner's unsupported conclusion that the road segment data and direction of travel information is at a lane-level resolution cannot support a *prima facie* case of obviousness

against claims 1 and 28.

The cited references also fail to disclose a "driver assist subsystem configured to assist a driver of the host vehicle based on the data elements stored in the geospatial database", from which the database manager receives database queries as described in claim 1, or "a database accessing system configured to access the objects in the geospatial database, in response to a query from the driver assist subsystem", as described in claim 27. Appellant disagrees with the Examiner's finding that the "user" of Smith et al. is a "driver assist subsystem" under the "broadest reasonable interpretation of that limitation in the claim language", since "the user necessarily must input the queries into an interface, shown in FIG. 1."

Appellant submits that the Examiner's interpretation of the claim -- that the subsystem would be the user who assists him or herself based on the data elements stored in the geospatial database -- is unreasonable in light of the specification of the present application and the plain meaning of the claim language. A reasonable interpretation of the claim requires consideration of the specification on which it is based, not in a vacuum. In re Dean, 291 F.2d 947, 130 USPQ 107, 110 (CCPA 1961). The plain meaning of the claim clearly indicates that Appellant is attempting to describe something other than the user that provides assistance to the user based on the data elements stored in the geospatial database as supported by the specification. For instance, the specification generally describes the subsystem on page 6, lines 26-27 as being configured to "assist the driver of vehicle 12 in a variety of different ways." Embodiments of the subsystem described in the specification include a "head-up display . . . [for] creating a virtual representation of the views out the windshield that allow the operator to safely maneuver the vehicle in impaired or low visibility conditions [page 7, lines 13-18]." and a "virtual mirror or other vision

assist system that creates a virtual representation of views looking in different directions from vehicle 12 [page 7, lines 18-21]." Additional embodiments of the subsystem include a "virtual rumble strip that provides a haptic feedback through the steering wheel, brake pedals, the seat, etc. to give the operator a sense of the vehicle position within a current lane" [page 7, lines 22-26] and other driver assisting components.

Appellant submits that the rejection is improper because there is no support in the specification for the Examiner's interpretation of the claim language. Accordingly, Appellant submits that Smith et al. fail to disclose or suggest the claimed driver assist subsystem of claims 1 or 27.

Accordingly, Appellant submits that the Examiner has failed to establish a *prima facie* case of obviousness against independent claims 1 and 29, and requests that the rejections be withdrawn. Appellant further submits that all claims depending from claims 1 and 27 are allowable as being dependent from an allowable base claims.

D. CLAIMS 2-5 ARE NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL. AND ROGERS ET AL.

Claims 2-5 depend from claim 1, and describe the response period of the database manager and the query processor as being provided in substantially real time, less than 100 milliseconds (ms), less than 50 ms, and less than 12 ms, respectively. The Examiner rejected claims 2-5 by finding that "the actual speed of the processing will be dependent on the design choice of the processor and its processing capabilities, as is well-known to one of ordinary skill in the art." However, the Examiner failed to provide any suggestion or motivation for such high-speed database query processing in Smith et al. Appellant submits that it would be completely unnecessary to provide database query

processing times of 100 ms or less in the navigational system of Smith et al., because such processing speeds are unnecessary for the navigational system of Smith et al. to function properly.

The present invention, on the other hand, makes use of such high speed database query processing, since it is essential to provide the necessary information to the subsystems substantially in real time in order for them to carry out their various functions. For example, the head-up display subsystem is configured to create a virtual representation of the views out the windshield that allow the operator to maneuver the vehicle in impaired or low visibility conditions [page 7, lines 9-26]. Such a function would not be possible without near real time response capability of the GDMS.

Accordingly, Appellant submits that claims 2-5 describe non-obvious features of the invention of independent claim 1, and requests that the rejections be withdrawn.

E. CLAIMS 15-22 ARE NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL. AND ROGERS ET AL.

Appellant also disagrees with the rejections of claims 15-22. The Examiner rejected the claims based upon a finding that Smith et al. teaches "a variety of different attributes that may be included in the database (column 8, lines 1-25), that are not limited to only those explicitly defined, but also to other attributes common in a geospatial database." However, the Examiner failed to cite any teachings in Smith et al. or Rogers et al. of the attributes described in claims 15-22.

Although the Examiner argues, in Section 10d of the Office Action, that Breed et al. (U.S. Patent No. 6,526,352 B1) and Cherveny et al. (U.S. Patent No. 6,047,234 A) provide evidence of the attributes described in claims 15-22, the rejections of claims 15-22 are not based upon those references, but only on

Smith et al. and Rogers et al. Furthermore, neither Breed et al. or Cherveny et al. disclose that the "data objects are configured based on requirements of the driver assist subsystem", or that the "attributes are indicative of how to draw the data object on a display", as described in claims 19 and 20, respectively.

Moreover, Breed et al. was filed July 19, 2001. The present application claims priority to at least March 5, 2001. Accordingly, Appellant submits that Breed et al. is not prior art to the present application.

Furthermore, even it is assumed that Breed et al. and Cherveny et al. disclose the attributes and features described in claims 15-22, there must still be some evidence of a motivation or suggestion outside of Appellant's disclosure to modify Smith et al. to include those attributes. Appellant submits that no such motivation exists, since the navigational system of Smith et al. has no need for a geospatial database that includes objects that are representative of a lane boundary (claim 15), a roadway shoulder (claim 16), a roadway island (claim 17), a roadway lane center (claim 18), structures adjacent to the travel paths (claim 21), mailboxes, jersey barriers, guard rails, bridge abutments, tunnel walls, ground plane and ceiling, curbs, curb cutouts, fire hydrants, light posts, traffic signal posts, sign and sign posts (claim 22), in order to perform its intended navigational function. Additionally, Smith et al. fails to include the claimed driver assist subsystem and, as a result, has no need for a geospatial database that includes objects that "are configured based on requirements of the driver assist subsystem" as described in claim 19, or objects whose "attributes are indicative of how to draw the data object on a display", as described in claim 20. Appellant submits that evidence of a motivation or suggestion to modify Smith et al. to include the attributes and features of claims 15-22, outside of Appellant's disclosure, must be provided for the rejections to be proper.

Accordingly, Appellant submits that the Examiner has failed to establish a *prima facie* case of obviousness against claims 15-22, and requests that the rejections be withdrawn.

F. CLAIM 23 IS NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL. AND ROGERS ET AL.

In rejecting independent claim 23, the Examiner found Smith et al. to teach the claimed geospatial database and database accessing system, except that "Smith does not teach the accuracy of the location coordinates being sufficient to distinguish among different lanes of travel." [Section 10h. of the Office Action, emphasis added] However, the Examiner found Rogers et al. to teach "accuracy at the decimeter and centimeter levels (sufficient to distinguish between lanes of travel) . . . ." The Examiner then concluded that "[I]t would have been obvious to one of ordinary skill in the art, at the time of the invention, to have an accuracy in location coordinates sufficient to distinguish between the lanes of travel in the invention of Smith, as achieved through well-known methods in the art shown by Rogers."

As explained in subsection B. above, resolution and accuracy are distinct characteristics of the objects contained in the geospatial database. The accuracy of the location information provided for the data object or element is essential in determining where the object is located, but has no bearing on its position relative to other objects located nearby. The resolution of the objects or elements contained in the geospatial database determines the detail of the information that is recorded about the travel path. In claim 23, the resolution of the objects stored within the geospatial database is high enough to allow for different lanes within the travel path to be

distinguished. Accordingly, objects in the geospatial database are positioned close enough together such that individual lanes of the travel path can be distinguished from adjoining lanes, for example. Therefore, regardless of the accuracy at which the nodes of Smith et al. are recorded, the spacing of the nodes (end points of the road connected by a line) is not at the claimed lane-level resolution. Unlike the geospatial database of the present invention, which makes use of the lane-level resolution of the stored objects (e.g., the head-up display, lane departure warnings, etc.), the navigational system of Smith et al. has no need for such a lane-level resolution to perform its general navigational function.

Therefore, even if the Examiner's interpretation of the cited references is correct, they still fail to disclose or suggest all of the elements of the claim. Accordingly, Appellant submits that the rejection of claim 23 is improper. Appellant further submits that all claims depending from claim 23 are allowable as being dependent from an allowable base claim.

G. CLAIMS 24-27 ARE NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL. AND ROGERS ET AL.

Claims 24-26 depend from claim 23, and describe the response period of the database accessing system as being provided in less than 100 ms, less than 50 ms, and less than 12 ms, respectively. The Examiner rejected the claims for the reasons set forth above with regard to claims 2-5. Appellant respectfully believes that the rejections are improper since the Examiner failed to provide any suggestion or motivation for such high-speed database query processing in Smith et al. As mentioned above, Appellant submits that Smith et al. lacks any need for processing times of 100 ms or less. The present invention, on the other hand, makes use of the high speed database accessing system, which allows the

subsystems (e.g., head-up display, lane departure warning, etc.) to perform their desired function.

Accordingly, Appellant submits that claims 24-26 describe non-obvious features of the invention of independent claim 23, and requests that the rejections be withdrawn.

II. REJECTIONS OF CLAIMS 31-33 AND 40 UNDER 35 U.S.C. §103 AS BEING UNPATENTABLE OVER THE COMBINATION OF SMITH ET AL. (U.S. PATENT NO. 6,184,823) AND ROGERS ET AL. (U.S. PATENT NO. 6,144,335) AND IN VIEW OF SCHOFIELD ET AL. (U.S. PATENT NO. 5,949,331) ARE IMPROPER

A. CLAIMS 31 AND 32 ARE NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL., ROGERS ET AL. AND SCHOFIELD ET AL.

Claims 31 and 32 depend from claim 1 and describe the driver assist subsystem as including "a head-up display that generates an image of boundaries of the lanes of the travel paths" (claim 31), wherein "the boundaries of the image substantially overlay actual lane boundaries of the travel paths when viewed by the driver of the host vehicle." (claim 32). In other words, the boundaries of the displayed image are in line with a line of sight of the driver of the host vehicle and the actual real world lane boundaries, as opposed to a displayed image of the lane boundaries [see page 8, lines 3-20]. The Examiner found Schofield et al. to teach the head-up display of claim 31 and concluded that "[i]t would have been obvious to one of ordinary skill in the art, at the time of invention, to include a head-up display that generates [an] image of the lanes of the travel path in the system of the combination [Smith et al. and Rogers et al. as applied to claim 1], as taught by Schofield, in order to increase the driver's awareness of the objects around the vehicle."

Appellant submits that the rejection is improper because there is no motivation to make the suggested combination outside of Appellant's disclosure. In particular, the purpose of the head-up display of the present application is to provide visual assistance in maintaining the vehicle within a lane of the travel path, which is unrelated to the general navigational purpose of Smith et al. This is evidenced by the fact that nowhere in Smith et al. is any need expressed for a head-up display that generates an image of lane boundaries. The system of Smith et al. is

designed to provide the user all of the information that is needed for the navigational purpose it sets out to satisfy, which does not include a need for the claimed head-up display. Appellant submits that a valid motivation or suggestion to combine the references and modify Smith et al. to include a head-up display requires more than the existence of the potential benefit identified by the Examiner, a benefit that only Appellant has been able to recognize. Accordingly, Appellant submits that the motivation or suggestion of the modification is improperly discerned from Appellant's disclosure. Accordingly, Appellant submits that the rejections are improper.

Additionally, Schofield et al. fails to disclose the head-up display of claim 32. Instead, Schofield et al. merely discusses providing a "panoramic view rearwardly of the vehicle . . . [that] enhances the ability of the driver to judge location and speed of trailing vehicles." [column 4, lines 1-15]. Accordingly the display of Schofield does not serve the purpose of the head-up display of claim 32, which is to provide visual assistance in maintaining the vehicle within a lane of the travel path. Moreover, the image 42 provided on the display 20 of Schofield et al. is a rearward view (i.e., sides and rear of the vehicle), while the display 20 is positioned in front of the driver D, as shown in FIG. 2. Accordingly, it is impossible for the displayed horizontal lines in the image 42 of Schofield to "overlay actual lane boundaries of the travel paths when viewed by the driver of the host vehicle", as described in claim 32. For example, when the driver of the system of Schofield et al. looks at the display 20, the displayed lines overlay <u>images</u> of the actual lane boundaries rather than the actual lane boundaries themselves. Additionally, the displayed lines of Schofield et al. do not overlay the overlay the actual lane boundaries as viewed by the driver, which are in front of the vehicle (i.e., the boundaries viewed through the windshield), but instead overlay an image of

the lane boundaries that are in the rear of the vehicle. As a result, Appellant submits that Schofield et al. fails to disclose the head-up display of claim 32.

Accordingly, Appellant submits that the rejection is improper.

B. CLAIM 33 IS NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL., ROGERS ET AL. AND SCHOFIELD ET AL.

Appellant respectfully disagrees with the Examiner's finding that the cameras 14 and 16 of Schofield et al. teach the radar subsystem of claim 33. In particular, nowhere in the cited reference is there any teaching of the cameras 14 and 16 "detect[ing] objects in a vicinity of the host vehicle." Instead, the cameras 14 and 16 of Schofield et al. merely capture images. Although it may be possible for someone to use the captured images to detect such objects, the cameras 14 and 16 do not provide such a detection function. Additionally, the cited cameras 14 and 16 fail to "pass a location of the detected objects to the head-up display" as described in claim 33. Although object distance detection may be one form of object detection, there is no disclosure in Schofield et al. of using the distance detection to "pass a location of the detected objects to the head-up display", as described in claim 33, since a distance, by itself, is not a location.

Moreover, Schofield et al. fail to disclose "a head-up display which modifies the image to include a graphical representation of the detected objects that substantially overlay the detected objects when viewed by the driver of the host vehicle", as described in claim 33.

Accordingly, Appellant submits that claim 33 is patentable in view of the cited references.

C. CLAIM 40 IS NOT RENDERED UNPATENTABLE UNDER 35 U.S.C. 103(a) BY THE COMBINATION OF SMITH ET AL., ROGERS ET AL. AND SCHOFIELD ET AL.

With regard to claim 40, the Examiner found column 9, line 4, and lines 24-32 of Schofield et al. to disclose the invention described in claim 40. However, the cited sections only relate to image compression using techniques that are unrelated to the invention described in claim 40. In particular, the cited sections are unrelated to a radar filtering subsystem "that blocks the passage of the location of selected objects, detected by the radar subsystem, to the head-up display", as described in claim 40. Furthermore, even if one assumes that the Examiner's findings regarding Schofield et. al. are correct, there is still no motivation or suggestion to combine its teachings with those of Smith et al. and Rogers et al. Accordingly, Appellant submits that the rejection is improper.

III. REJECTIONS OF CLAIMS 34, 36, 37, 41 AND 42 UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER THE COMBINATION OF SMITH ET AL. (U.S. PATENT NO. 6,184,823) AND ROGERS ET AL. (U.S. PATENT NO. 6,144,335) AND IN VIEW OF WILSON-JONES ET AL. (U.S. PATENT NO. 5,765,116) ARE IMPROPER

The Examiner found Wilson-Jones et al. to teach the haptic feedback features of claims 34, 36, 37, 41 and 42 and concluded that "[i]t would have been obvious to one of ordinary skill in the art, at the time of invention, to include haptic feedback in the system of the combination [Smith et al. and Rogers et al. as applied to claim 1], as taught by Wilson-Jones, in order to warn a driver that the vehicle is crossing lane boundaries." Appellant respectfully disagrees with the Examiner's conclusion.

The purposes of Smith et al. and Wilson-Jones et al. are distinct: Smith et al. only provide basic mapping functions for route guidance; Wilson-Jones et al. provide assistance in maintaining a vehicle within a lane. Neither reference discusses

using their system in combination with systems that provide the purpose of the other. Appellant submits that a valid motivation or suggestion to combine the references and modify Smith et al. to include the driver's assistance system of Wilson-Jones et al. requires more than the existence of the potential benefit identified by the Examiner, a benefit that only Appellant has been able to recognize. Accordingly, it is only through the reading of Appellant's disclosure that the benefit cited by the Examiner is realized. Therefore, Appellant submits that the rejections are improper due to an insufficient suggestion or motivation to combine the references as required to establish a *prima facie* case of obviousness.

IV. REJECTION OF CLAIM 35 UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER THE COMBINATION OF SMITH ET AL. (U.S. PATENT NO. 6,184,823), ROGERS ET AL. (U.S. PATENT NO. 6,144,335), WILSON-JONES ET AL. (U.S. PATENT NO. 5,765,116), AND BREED ET AL. (U.S. PATENT NO. 6,370,475) ARE IMPROPER

As mentioned above, Appellant believes that Breed et al. is disqualified as prior art against the claimed invention. Accordingly, Appellant submits that the rejections based on Breed et al. are improper.

Moreover, even if Breed et al. was determined to be prior art to the claimed invention, the suggested combination would still not render claim 35 unpatentable. In particular, Wilson-Jones et al. fail to provide any teaching of generating haptic feedback based upon data elements stored in a geospatial database. Accordingly, even if the database of Breed et al. was combined with the system of Wilson-Jones et al., the haptic feedback generated by Wilson-Jones et al. would still be based upon a detection of the lane markings of a road using a video camera, since Wilson-Jones et al. provide no means for utilizing the information in the database of Breed et al. for the purpose of providing haptic feedback. Accordingly, the combination of the

cited references fails to generate haptic feedback "in response to a position of a host vehicle relative to the location of the objects corresponding to the data elements stored in the geospatial database", as described in claim 35.

Furthermore, there is no motivation or suggestion of combining Smith et al., Rogers et al., Wilson-Jones et al., and Breed et al., and making the necessary modifications to Smith et al. to form the claimed invention, for the reasons set forth above.

As a result, Appellant submits that the rejection is improper.

V. REJECTIONS OF CLAIMS 38 AND 39 UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER THE COMBINATION OF SMITH ET AL. (U.S. PATENT NO. 6,184,823), ROGERS ET AL. (U.S. PATENT NO. 6,144,335), AND BREED ET AL. (U.S. PATENT NO. 6,370,475) ARE IMPROPER

As mentioned above, Appellant believes that Breed et al. is disqualified as prior art against the claimed invention. Accordingly, Appellant submits that the rejections based on Breed et al. are improper.

VI. REJECTION OF CLAIM 43 UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER THE COMBINATION OF SMITH ET AL. (U.S. PATENT NO. 6,184,823), ROGERS ET AL. (U.S. PATENT NO. 6,144,335), AND DOBLER ET AL. (U.S. PATENT NO. 6,038,496) ARE IMPROPER

In general, Appellant disagrees with the Examiner's finding that Dobler et al. teach a radar system that is used with a vehicle to detect objects in the vehicle's vicinity and issue a warning to the driver at column 1, lines 5-16. In particular, the system of Dobler et al. fails to "pass a location of the detected objects to the driver assist subsystem" as described in claim 43. Additionally, Appellant submits that a valid motivation or

suggestion to modify Smith et al. to include the identified teachings of the cited references requires more than the existence of the potential benefit identified by the Examiner, a benefit that only Appellant has been able to recognize. Accordingly, it is only through the reading of Appellant's disclosure that the benefit cited by the Examiner is realized. Therefore, Appellant believes that the rejection of claim 43 is improper.

VII. CONCLUSION

Based on the foregoing, Appellant submits that claims 1-44 are in condition for allowance.

Respectfully submitted,

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BDK/djb

Appendix

1. (original): A geospatial database management system (GDMS), mounted on a host vehicle, managing geospatial data relating to travel paths having one or more lanes, comprising:

a geospatial database storing data elements indicative of objects and a location of the objects in three dimensional space, the objects having a lane-level resolution and the location having an accuracy of approximately one decimeter or less;

a database manager component configured to maintain the data elements in the geospatial database and receive database queries from a driver assist subsystem configured to assist a driver of the host vehicle based on the data elements stored in the geospatial database; and

a query processor coupled to the database manager component and the geospatial database and configured to receive the database queries from the database manager component, query the geospatial database based on the database queries and return query results to the database manager component.

2. (original): The GDMS of claim 1 wherein the database manager component and the query processor are configured to return the query results in substantially real time.

3. (original): The GDMS of claim 2 wherein the database manager component and the query processor are configured to return the query results within approximately 100 milliseconds (ms) of receiving the database query from the driver assist subsystem.

4. (original): The GDMS of claim 3 wherein the database manager

component and the query processor are configured to return the query results within approximately 50ms of receiving the database query from the driver assist subsystem.

5. (original): The GDMS of claim 3 wherein the database manager component and the query processor are configured to return the query results within approximately 12ms of receiving the database query from the driver assist subsystem.

6. (previously presented): The GDMS of claim 3 wherein the location of the objects in the geospatial database is accurate to within less than one decimeter.

7. (original): The GDMS of claim 6 wherein the location of the objects in the geospatial database is accurate to within less than approximately +/- 0.1 meters.

8. (original): The GDMS of claim 7 wherein the location of the objects in the geospatial database is accurate to within a range of approximately +/- 2-10 centimeters.

9. (original): The GDMS of claim 1 wherein the database query from the driver assist subsystem includes a query polygon indicative of a geospatial region of interest and wherein the query processor is configured to identify data elements in the geospatial database that have a location that intersects with the query polygon.

10. (original): The GDMS of claim 9 wherein the database manager component maintains the geospatial database according to tiles, each tile corresponding to a predetermined geospatial region, each tile including one or more corresponding data element lists, each data element list listing data elements of a specified

element type that intersect with the corresponding tile.

11. (original): The GDMS of claim 10 wherein the query processor is configured to identify data elements in the geospatial database that have a location that intersects with the query polygon by identifying tiles as intersecting tiles if they intersect with the query polygon.

12. (previously presented): The GDMS of claim 11 wherein the database query includes a data element indicator indicating relevant data element types that are relevant to the database query, and wherein the query processor is configured to search the data element lists in the intersecting tiles to identify relevant data element lists that contain data elements having the relevant data element types.

13. (original): The GDMS of claim 12 wherein the query processor is configured to identify data elements in the geospatial database that have a location that intersects with the query polygon by identifying data elements in the relevant data element lists that intersect with the query polygon.

14. (original): The GDMS of claim 1 wherein the database manager component is configured to maintain the data elements in the geospatial database as data objects having an attribute portion and a spatial data portion, the attribute portion including attributes indicative of the data object and the spatial data portion including data indicative of the location of the object in three dimensional space.

15. (original): The GDMS of claim 14 wherein the data objects include a LaneBoundary object representative of a roadway lane boundary.

16. (original): The GDMS of claim 14 wherein the data objects include a RoadShoulder object representative of a roadway shoulder.

17. (original): The GDMS of claim 14 wherein the data objects include a RoadIsland object representative of a roadway island.

18. (original): The GDMS of claim 14 wherein the data objects include a LaneCenter object representative of a roadway lane center.

19. (original): The GDMS of claim 14 wherein the data objects are configured based on requirements of the driver assist subsystem.

20. (original): The GDMS of claim 14 wherein the attributes are indicative of how to draw the data object on a display.

21. (original): The GDMS of claim 14 wherein the data objects include objects representative of structures adjacent to the travel paths.

22. (original): The GDMS of claim 21 wherein the data objects are representative of one or more of mailboxes, jersey barriers, guard rails, bridge abutments, tunnel walls, ground plane and ceiling, curbs, curb cutouts, fire hydrants, light posts, traffic signal posts, sign and sign posts.

23. (original): A geospatial database management system (GDMS) for use on a host vehicle with a driver assist subsystem, comprising:

a geospatial database storing objects having attributes indicative of items relating to a travel path for the host vehicle and a location of the items in a

coordinate system, the objects being stored with lane-level resolution sufficient to distinguish among different lanes in the travel path; and

a database accessing system configured to access the objects in the geospatial database, in response to a query from the driver assist subsystem, in substantially real time.

24. (original): The GDMS of claim 23 wherein the database accessing system is configured to return query results within approximately 100 milliseconds (ms) of receiving the query from the driver assist subsystem.

25. (original): The GDMS of claim 24 wherein the database accessing system is configured to return the query results within approximately 50ms of receiving the query from the driver assist subsystem.

26. (original): The GDMS of claim 25 wherein the database accessing system is configured to return the query results within approximately 12ms of receiving the query from the driver assist subsystem.

27. (original): A geospatial database management system (GDMS) for use on a host vehicle with a driver assist subsystem, comprising:

a geospatial database storing objects having attributes indicative of items relating to a travel path for the host vehicle and a location of the items in a coordinate system, the location being accurate to within approximately 1 decimeter; and

a database accessing system configured to access the objects in the geospatial database, in response to a query from the driver assist subsystem, in substantially real

time.

28. (original): The GDMS of claim 27 wherein the geospatial database stores the objects with lane-level resolution sufficient to distinguish among different lanes in the travel path.

29. (original): The GDMS of claim 27 wherein the location is accurate to within approximately +/- 0.1 meters.

30. (original): The GDMS of claim 29 wherein the location is accurate to within a range of approximately +/- 2-10 centimeters.

31. (previously presented): The system of claim 1, wherein the driver assist subsystem includes a head-up display that generates an image of boundaries of the lanes of the travel paths.

32. (previously presented): The system of claim 31, wherein the head-up display is positioned in the host vehicle such that the boundaries of the image substantially overlay actual lane boundaries of the travel paths when viewed by the driver of the host vehicle.

33. (previously presented): The system of claim 32, including a radar subsystem configured to detect objects in a vicinity of the host vehicle and pass a location of the detected objects to the head-up display which modifies the image to include a graphical representation of the detected objects that substantially overlay the detected objects when viewed by the driver of the host vehicle.

34. (previously presented): The system of claim 1, wherein the driver assist subsystem generates haptic feedback to the driver of the host vehicle.

35. (previously presented): The system of claim 34, wherein the haptic feedback is generated in response to a position of the host vehicle relative to the location of the objects corresponding to the data elements stored in the geospatial database.

36. (previously presented): The system of claim 34, wherein the haptic feedback is generated through a steering wheel, a brake pedal, or a seat.

37. (previously presented): The system of claim 34, wherein the driver assist subsystem is a virtual rumble strip.

38. (previously presented): The system of claim 1, wherein the driver assist subsystem generates a warning based on a position of the host vehicle relative to the location of the objects corresponding to the data elements stored in the geospatial database.

39. (previously presented): The system of claim 38, wherein the warning is at least one of a visual warning, an audio warning, a tactile warning, and a haptic warning.

40. (previously presented): The system of claim 33, including a radar filtering subsystem that blocks the passage of the location of selected objects, detected by the radar subsystem, to the head-up display.

41. (previously presented): The system of claim 34, wherein the haptic feedback includes at least one stimulus applied to the driver of the host vehicle.

42. (previously presented): The system of claim 41, wherein the stimulus includes at least one of a vibration, a force, a torque, and a motion.

43. (previously presented): The system of claim 1, including a radar subsystem configured to detect objects in a vicinity of the host vehicle and pass a location of the detected objects to the driver assist subsystem.

44. (previously presented): A geospatial database management system (GDMS), mounted on a host vehicle, managing geospatial data relating to travel paths having one or more lanes, comprising:

a geospatial database storing data elements indicative of objects and a location of the objects in three dimensional space, the objects having a lane-level resolution and the location having an accuracy of approximately one decimeter or less;

a database manager component configured to maintain the data elements in the geospatial database and receive database queries from a driver assist subsystem configured to assist a driver of the host vehicle based on the data elements stored in the geospatial database;

a query processor coupled to the database manager component and the geospatial database and configured to receive the database queries from the database manager component, query the geospatial database based on the database queries and return query results to the database manager component; and

a radar filtering subsystem that blocks the passage of the location of selected objects, detected by the radar subsystem, to the driver assist subsystem.